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Patent Application for:

METHOD AND APPARATUS FOR OPERATING SYSTEM
AND APPLICATION SELECTION

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7 **METHOD AND APPARATUS FOR OPERATING SYSTEM**
8 **AND APPLICATION SELECTION**
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12 **FIELD OF THE INVENTION**

13 This invention relates generally to the field of download of operating systems
14 and operating software. More particularly, certain embodiments of this invention
15 relate to a simplified method and apparatus for selection of an application and
16 associated operated system for download and execution in an interactive electronic
17 device such as Set Top Boxes (STB) for television (e.g. satellite and cable
18 applications) and Internet Appliances.
19

20 **BACKGROUND OF THE INVENTION**

21 Increasingly, consumer products such as satellite receivers, cable set top
22 boxes and the like are including some sort of client/server functions such as full or
23 limited Internet connectivity for interactive electronic programming guides (EPG),
24 Web browsing, message exchange, E-mail and other services. With standards
25 emerging and evolving, and multiple operating systems in use by different service
26 providers, hardware is increasingly dependant upon software and firmware
27 upgrades to continue to function and to provide continually enhanced functionality.

28 Even in the field of cable television Set Top Boxes, several different and
29 generally incompatible standards have evolved with differing levels of functionality

1 required by different cable systems. In order to meet the demands for manufacture
2 of such Set Top Boxes, manufacturers must supply a different STB for each system
3 with different firmware or software designed for that particular system.

4 As the availability of broadband communications expands, users will
5 increasingly be able to make a choice from among various service providers for
6 television programming and interactive services. Each such provider may have its
7 own operating system (e.g. operating systems marked under the trademarks
8 Windows™, Windows CE™, Linux™, VxWorks™, Aperios™, QNX™, etc.) and its
9 own application software. To provide the user with the ability to select from among
10 the various service providers, a simple to use, flexible hardware system which can
11 operate under numerous operating systems to provide various applications would
12 be desirable and advantageous over a requirement for separate hardware and/or
13 software for each such provider. Such a system, to be successful, should be easy
14 for the operator to use and upgrade. The present invention addresses these issues
15 in a device which can be readily adapted to a new operating system and
16 application in an easy to use, user transparent manner.

17 18 **SUMMARY OF THE INVENTION**

19 The present invention relates generally to a simplified method and apparatus
20 for download and execution of an application and operating system. Objects,
21 advantages and features of the invention will become apparent to those skilled in
22 the art upon consideration of the following detailed description of the invention.

23 In one embodiment of the present invention embodied in a client device
24 capable of operating using a plurality of operating systems on which a plurality of
25 applications run, a method of downloading an operating system and an application
26 which runs on the operating system includes providing a menu of selections
27 representing a plurality of available applications including said application;
28 receiving a signal representing a user's selection of a desired application;
29 responsive to receiving the signal, connecting to a service provider; downloading
30 the operating system associated with the desired application from the service

1 provider; downloading the desired application; and executing the desired
2 application.

3 In an exemplary embodiment of the present invention embodied in a
4 television Set Top Box, includes a processor capable of running application
5 software under a plurality of operating systems. A program provides code for:
6 displaying an icon representing an application; responsive to the selection of the
7 icon for initiating a download of an operating system associated with the
8 application; initiating a download of the application software associated with the
9 icon; and executing the application on the processor using the operating system.

10 A client device capable of running applications under a plurality of operating
11 systems in accordance with an exemplary embodiment consistent with the present
12 invention includes a central processor. A first memory stores boot code for booting
13 the central processor into an operational state which presents a user with a choice
14 of a plurality of operational environments. A modem, which downloads from a
15 remote server an operating system associated with a selection by the user of an
16 operating environment. The first memory, upon completion of the download,
17 configures the client device to run under the operating system.

18 In another exemplary embodiment, a computer-readable medium tangibly
19 embody instructions which, when executed by a computer, implement a process
20 including: presenting a user with a selection of operating environments; receiving
21 a user input selecting an operating environment; downloading an operating system
22 corresponding to the operating environment; and loading and running the operating
23 system.

24 The above summaries are intended to be exemplary embodiments of the
25 invention which will be best understood in conjunction with the detailed description
26 to follow and are not intended to limit the scope of the appended claims.

27 28 **BRIEF DESCRIPTION OF THE DRAWINGS**

29 The features of the invention believed to be novel are set forth with
30 particularity in the appended claims. The invention itself however, both as to

1 organization and method of operation, together with objects and advantages
2 thereof, may be best understood by reference to the following detailed description
3 of the invention, which describes certain exemplary embodiments of the invention,
4 taken in conjunction with the accompanying drawings in which:

5 **FIGURE 1** is a diagram of an exemplary system in accordance with certain
6 embodiments of the present invention.

7 **FIGURE 2**, including **FIGURES 2A** and **2B**, is a flow chart of an overall
8 process consistent with embodiments of the present invention.

9 **FIGURE 3** illustrates the system's operation as viewed by the user.

10 **FIGURE 4** is a flow chart of the exemplary system's operation as viewed by
11 the user.

12 DETAILED DESCRIPTION OF THE INVENTION

13 While this invention is susceptible of embodiment in many different forms,
14 there is shown in the drawings and will herein be described in detail specific
15 embodiments, with the understanding that the present disclosure is to be
16 considered as an example of the principles of the invention and not intended to limit
17 the invention to the specific embodiments shown and described. In the description
18 below, like reference numerals are used to describe the same, similar or
19 corresponding parts in the several views of the drawings.

20 Referring now to **FIGURE 1**, an exemplary system consistent with the
21 present invention is illustrated as 100. In this system, a client device such as a Set
22 Top Box 110 includes a central processing unit (CPU) 112 which is capable of
23 operating under a plurality of operating systems. Such devices include the X86
24 family of microprocessors and compatibles such as those produced by Intel
25 Corporation and ST Microelectronics. In the embodiment of **FIGURE 1**, the central
26 processor 112 is coupled via an ISA bus 116 to a Read Only Memory (ROM) 120,
27 and Electrically Erasable Programmable Read Only Memory (EEPROM) 122 and
28 a Flash Memory 126. CPU 112 is also coupled via a local bus to Random Access
29

1 Memory (RAM) 130. CPU 112 is also coupled to a user interface 134 using any
2 appropriate interconnection and to a modem 138 also using any appropriate
3 interconnection.

4 **TABLE 1** below describes generally the type of information stored in each
5 of the memory devices connected to CPU 112. Of course, those skilled in the art
6 will understand that the type of memory selection for each type of memory can be
7 modified without departing from the present invention. In accordance with the
8 present embodiment, the ROM 120 includes boot code which is used to boot up
9 the central processor 112 at power up and also includes a decompression
10 algorithm, a routine to control a download operation, various hardware and software
11 checks and error checking for the code which will be downloaded into the Flash
12 Memory. In addition, ROM 120 includes code for controlling a basic user interface
13 and device drivers as required as will be understood by those skilled in the art. The
14 EEPROM 122 stores a number of flags including flags which are set if the software
15 codes stored in ROM 120 detects hardware or software errors as well as a flag
16 which is set to indicate that an update is desired or required. The Flash Memory
17 122 is used to store downloaded operating system and application software while
18 the RAM 130 is used in a more or less conventional manner as operating memory.
19

20

MEMORY	CONTENT
ROM	Boot code including decompression algorithm, download routine, hardware check, error check for downloaded flash code, user interface.
EEPROM	Error and update flags, hardware check log
Flash memory	Downloaded operating system and application software
RAM	Operating memory

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25 **TABLE 1**

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1 The ROM 120 is programmed to cause the CPU 112 to perform various
2 functionality tests as well as to cause the client device 110 to dial via the modem
3 138 into a Master Server 150 to obtain basic services and to obtain access to
4 various application servers for download of an operating system and application
5 software. Upon dialing in to Master Server 150 and going through an authentication
6 process, the client device 110 is programmed to dial a local Internet service
7 provider (ISP) 154 and access one of a plurality of Application Servers 160-1, 160-2
8 through 160-N via the Internet 170. Upon dialing in to the selected Application
9 Server through the local Internet service provider 154, the Application Server 160
10 downloads through the Internet 170 and the local Internet service provider 154, a
11 selected operating system and application software. This software is loaded into
12 Flash Memory 126 to become the default operating system of the client device 110
13 until such time as either an update or a change is desired or required. An
14 exemplary process used for implementing the present invention as just briefly
15 described is explained in greater detail with referenced **FIGURE 2**.

16 Referring now to **FIGURE 2A** in conjunction with **FIGURE 2B**, process 200
17 describes the operation of the client device 110. For purposes of the exemplary
18 embodiment to follow, it is assumed that client device 110 is a Set Top Box, but
19 this is not to be limiting since other client/server arrangements and Internet
20 appliances could equally well utilize the present invention. Process 200 begins at
21 204 upon power on of the client device 110. Upon turning on the power, the CPU
22 112 boots using the code stored in ROM 120 and begins to perform a hardware
23 check at 206 to determine that the hardware of client device 110 is operating
24 properly. In the event it is not operating properly, various error reporting techniques
25 are used to inform the user to go through a troubleshooting process or contact a
26 service facility. These steps are not shown since they are not directly related to the
27 present invention. The results of the hardware check are logged to the EEPROM
28 112 for non-volatile storage. The CPU 112, operating under control of the code in
29 ROM 120, then inspects the EEPROM 122 at 210 to determine if an update flag is

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TOP SECRET

1 set. When received from the factory, the update flag will be set in order to drive a
2 programming of Flash Memory 126 with a user selected operating system. If the
3 update flag is set at 210, control passes to 212 where the user inputs registration
4 information to register for the first time use. Such information may, for example,
5 include owner's name, address, telephone number, etc.

6 The user then selects an application to run such as a cable network to which
7 the STB 110 is to be attached or a service to be supplied through the STB 110.
8 Control then passes to 214 where the CPU 112 is instructed by the boot code
9 stored in ROM 120 to decompress a set of code referred to herein as a Download
10 Manager and store that code to RAM 130. The processor then, again under
11 instructions from ROM 120, jumps to the Download Manager 218 which controls
12 the download process. The Download Manager instructs CPU 112 to dial the
13 Master Server 150 via modem 138 at 222. Upon making a connection between
14 modem 138 and Master Server 150 (preferably using a toll free connection) an
15 authentication process is invoked wherein the client device 110 is authenticated
16 using, for example, serial number and owner registration information entered
17 through user interface 134 to determine the client device 110 is authorized to use
18 the services of Master Server 150. This process takes place at 226 and, for the first
19 time use preferably involves a registration process for a new owner or new user of
20 a client device 110.

21 Once authentication is completed at 226 an exchange of encryption keys
22 takes place to assure the security of the communication to follow. Next, a
23 Universal Resource Locator (URL) of the desired application server (corresponding
24 to the application selected by the user at 212, is provided to the STB 110 from the
25 Master Server 150, and control passes to 230. If no local Internet service provider
26 is available at 230 an alternative Internet service provider, using either a toll or a toll
27 free call is provided at 234 and control passes to 240. If a local Internet service
28 provider 154 does exist, the local Internet service provider 154's dial-in telephone
29 number is provided to STB 110 at 244. Control then passes to 240 where the
30 Internet service provider (e.g. 154) is dialed and the client device 110 instructs the

1 ISP to go to the designated URL determined by the selection of application servers.
2 When the application server 160 corresponding to the URL (which corresponds to
3 the selected application) is reached, an authentication process again takes place
4 at 246; and at 250 the operating system and application software are downloaded
5 into Flash Memory 126. The update flag is then cleared at 256 and the system
6 reboots at 260.

7 At the reboot, ROM 120's boot code again boots the CPU 112 and performs
8 the hardware check and logs the results to EEPROM 122 at 206. Since the update
9 flag has been cleared, it will not be set at 210 and the ROM 120 proceeds to direct
10 CPU 112 to check the image stored in Flash Memory 126 at 264. If there is a
11 problem with the checksum (or other error detection mechanism) for the image in
12 Flash Memory, at 268 control passes back to 214 where the process of
13 downloading the image corresponding to the selected application and operating
14 system for the flash memory is repeated. However, if the image in Flash Memory
15 checks okay at 268, the boot code in ROM 120 decompresses the operating
16 system and application stored in Flash Memory 126 to RAM 130 at 274. ROM 120
17 then directs the CPU to jump to the application and run the application under the
18 operating system at 278. The client device (STB) 110 generally continues to
19 operate under the downloaded operating system running the downloaded
20 application until such time as an event causes the update flag to be set again at
21 284 at which point a reboot is initiated at 260 and control returns to 206 as with the
22 initial power up.

23 The process 200 which has just been described is preferably carried out in
24 a manner which is very transparent to the user. In one embodiment, upon the initial
25 power up of the client device, the user is presented with a screen asking for
26 registration information such as name, address, telephone number, etc. Next, the
27 user is presented with a screen asking for selection of an application. Upon
28 selection of the application the user simply waits for the download process to
29 complete at which time the client device 110 again boots up and the resulting boot
30 up image seen by the user is the application selected by the user. Subsequently,

1 when the user powers up or otherwise enables his client device 110, he is simply
2 presented with the application running under the operating system which he initially
3 selected until such time as either the system or the user determines that an update
4 or a change in application is desired.

5 **FIGURE 3** illustrates a Set Top Box embodiment of the current invention in
6 a system 300 wherein after completing registration information or verifying the
7 registration information, the user is presented with a television screen 310 showing,
8 in this example, three possible choices of applications. The first application is to
9 operate the Set Top Box device using an application called Sony Network TV 312.
10 The second choice is to operate the Set Top Box 110 as a Web TV Networks
11 Device 316 and the third choice is to operate the Set Top Box 110 as an XYZ
12 Networks Device illustrated as icon 320. The user's screen is provided with icons
13 or other menu selections such as 312, 316 and 320 which the user can select
14 using a remote controller 330 to move a cursor or other indicator 336 to the
15 appropriate selection.

16 Once the selection has been made, the Set Top Box 110, in a manner
17 transparent or near transparent to the user, initially dials the Master Server 150 in
18 the manner previously described, obtains a URL and an ISP telephone number
19 from the Master Server 150. Using this information the Set Top Box communicates
20 through the Internet to one of three servers: 360-1, 360-2 or 360-3 which serve as
21 Application Servers for Sony network TV, Web TV Networks or XYZ Networks
22 respectively. The Set Top Box 110 then downloads the operating system and the
23 appropriate application to permit the Set Top Box 110 to operate in the mode
24 selected by the user. The Set Top Box 110 then re-boots into the application
25 selected by the user. This process is illustrated in **FIGURE 4** as process 400.

26 At power-on 402, the Set Top Box 110 determines that this is the first use
27 (by presence or absence of registration information) at 404. If it is the first use at
28 404, registration information is collected from the user at 408 and control passes
29 to 412 where the user selects an icon or other menu selection for the desired

1 service. The Set Top Box 110 then contacts the Master Server at 416,
2 authenticates, registers the user and obtains an ISP telephone number and a URL
3 corresponding to the selected application. At 420 the Set Top Box 110 contacts the
4 URL through the ISP provided by the Master Server 150 and at 426 the operating
5 system and application associated with the URL and the selection made by the
6 user at 412 is flashed into the Flash Memory at 426. At 430, the application loads
7 and operates under the operating system. Control then passes to 434 until such
8 time as the user desires an update of the application or operating system which
9 directs controlled 412. If no update is desired at 434 and if the system has not
10 determined in some other way (for example by a message coming in from the
11 network) at 440 then the Set Top Box 110 continues to operate under the operating
12 system and application at 430. If either the user desires to update or change the
13 operating system or the system requires an update, control passes to 412 where
14 the user is again presented with the opportunity to select a service to be updated.

15 Those skilled in the art will appreciate that although the example given is
16 primarily directed to use of a Set Top Box in a television environment such as a
17 cable TV system, many other applications are possible for this technology. This
18 invention can be applied to Internet appliances as well as most any other client
19 server system in which multiple operating systems need to be accommodated. In
20 the embodiment described, the user essentially chooses both an application and
21 an operating system with a single click of an icon and although the underlying
22 operating system may even be unknown to the user, by selection of an application
23 (a television or Internet network in this example) the operating system required to
24 support the application is implicitly selected and the device operating under control
25 of the ROM 130 downloads the appropriate operating system and application in a
26 manner transparent to the user but simple to understand.

27 Those skilled in the art will recognize that the present invention has been
28 described in terms of exemplary embodiments based upon use of a programmed
29 processor. However, the invention should not be so limited, since the present
30 invention could be implemented using hardware component equivalents such as

1 special purpose hardware and/or dedicated processors which are equivalents to
2 the invention as described and claimed. Similarly, general purpose computers,
3 microprocessor based computers, micro-controllers, optical computers, analog
4 computers, dedicated processors and/or dedicated hard wired logic may be used
5 to construct alternative equivalent embodiments of the present invention.

6 The memory structure described above uses a ROM 120 to store boot code
7 and a flash memory 126 to store the operating system and application. However,
8 those skilled in the art will recognize that other storage technologies including
9 magnetic, optical and magneto-optical disc drive technologies could also be used
10 in variations of the invention without departing from the present invention. Such
11 variations are considered equivalents.

12 The present invention is preferably implemented using a programmed
13 processor executing programming instructions that are broadly described above in
14 flow chart form. Instructions for carrying out processes of the invention can be
15 stored in any suitable electronic storage medium. However, those skilled in the art
16 will appreciate that the processes described above can be implemented in any
17 number of variations and in many suitable programming languages without
18 departing from the present invention. For example, the order of certain operations
19 carried out can often be varied, and additional operations can be added without
20 departing from the invention. Error trapping can be added and/or enhanced and
21 variations can be made in user interface and information presentation without
22 departing from the present invention. Such variations are contemplated and
23 considered equivalent.

24 While the invention has been described in conjunction with specific
25 embodiments, it is evident that many alternatives, modifications, permutations and
26 variations will become apparent to those skilled in the art in light of the foregoing
27 description. Accordingly, it is intended that the present invention embrace all such